



Resources for living things

Strand

Earth and Beyond

Key concept

Living things use the resources of the Earth, solar system and universe to meet their needs.

Purpose

Activities in this module are designed to help students understand that living things can use the Earth and sun as resources. Students have opportunities to:

- collect information about different ways that the Earth and sun can be used as a resource by living things;
- plan and conduct investigations to answer their own questions about ways in which the Earth and sun are used as a resource;
- communicate their understandings of some uses made of the Earth and sun by people, other animals and plants.

Overview of activities

The following table shows the activities in this module and the way in which these are organised in **introductory**, **developmental** and **culminating** phases.

Introductory >	Developmental 🕨	Culminating
How do we use the Earth and the sun? What is soil?	The uses of soil The effect of the sun on plant growth	What have we learned?
	Why do gardeners grow plants in greenhouses?	
	The use of soil in mud bricks	
	How do earthworms use soil?	



Core learning outcomes

This module focuses on the following core learning outcomes from the Years 1 to 10 Science Syllabus:

Earth and Beyond 2.3 Students discuss how their community uses resources and features of the Earth and sky.

3.3 Students collect information which describes ways in which living things use the Earth and sun as resources.

This module incorporates the following core content from the syllabus:

Core content

Earth and Beyond

Earth and Beyond

- Using the Earth's environment
 - to obtain needs sun, water, shelter
- for human recreation

Using materials from the Earth

• building materials

Assessment strategy

Suggestions for gathering information about student learning are provided in each of the activities in this module. Once sufficient information has been collected, judgments can be made about students' demonstrations of outcomes. Typical demonstrations of this module's intended outcomes are provided here to indicate the pattern of behaviour to look for when making judgments.

2.3 Students discuss how their community uses resources and features of the Earth and sky.

Students may:

- describe ways their community values and uses the features and resources of the Earth and sun (such as soil, water, heat and light);
- discuss the importance of soil to their community;
- discuss some ways that their community modifies the resources of the Earth and sun to make them more useful.

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Earth and Beyond 3.3 Students collect information which describes ways in which living things use the Earth and sun as resources.

Students may:

- discuss ways that resources of the Earth and sun are used by people, other animals and plants, and changes that usage can cause;
- outline some possible uses of soil by people and other animals;
- discuss the advantages and disadvantages of ways that people modify the resources of the Earth and sun to make them more useful;
- describe some advantages and disadvantages of growing plants in a greenhouse;
- explore and elaborate on ideas about how plants use resources of the Earth and sun to grow.

Background information

Current scientific conceptions

The Earth has an atmosphere which is composed of approximately 78 per cent nitrogen, 21 per cent oxygen and 1 per cent other gases.

The solid part of the Earth has three distinct layers:

- the 'crust' which is the outermost layer consisting mainly of sedimentary rocks lying on ancient igneous rocks (mainly basalt and granite);
- the 'mantle' situated below the crust and composed of semi-molten silicate-rich rocks;
- the 'core' that is probably composed of iron and nickel, and which is liquid to the outside and solid in the centre.

Soil is made primarily from rocks. Rocks break down due to physical, chemical and biological agents and eventually form clay, silt, sand or gravel which combine together in different proportions to form soil. Soil production occurs over very long periods of time. Minerals in the parent rocks and their weathered products determine many of the properties of soil, including waterholding capacity, acidity and colour. Soil also contains air, water, organic material from dead or decaying plants and animals, and living things (such as worms, bacteria and fungi). Earthworms and other soil dwellers mix and aerate the layers of the soil and provide a steady supply of digested organic materials to the soil.

Life on Earth as we know it is not possible without the sun. The sun provides the main source of energy for the Earth including light (used by plants for photosynthesis) and heat (the source of energy for meteorological events).

Green plants use the energy from the sun (by a process called photosynthesis) to make their own 'food'. This food stores energy for the plant. It also supplies energy for the animals that eat them.



Students' prior understandings

Students' prior understandings may differ from current scientific conceptions in a range of ways.

Some students may think that:

- Soil is a static part of their environment, that it is always just 'there'. They may not appreciate the changing nature of the Earth, and the effects that these changes have on the world in which they live.
- Soil cannot be made from rock because rock is hard and sharp while soil is soft.
- There is only one type of soil, rather than a variety of soil types.
- Worms and other soil-dwellers have to come to the surface of soil in order to get air.
- Human activities do not cause changes in the major landscape of the Earth.
- The growth of a plant is not related to the effects of the sun and soil but only to factors concerned with the plant itself.

Teachers can assist students to develop their understandings about Earth and beyond by providing experiences which may challenge students' current ideas. The Earth and sun are part of students' everyday experiences, and students will have many ideas about them. However, what is obvious to adults may not be obvious to students. Provide students with opportunities to:

- develop awareness of events occurring over time for example, through keeping class and individual timelines or logbooks recording changes, such as environmental changes due to the activities of living things, or growth patterns of living things;
- investigate their current concepts to see if they are valid;
- challenge their current conceptions by experiencing ideas or demonstrations that challenge their current ideas;
- hear simple explanations of what scientists used to think, what they think now and why they changed their ideas. This allows students to see that they may also need to reconsider their views. It also demonstrates the tentative nature of scientific knowledge.

Terminology

Terms associated with soil, soil texture and energy from the sun are essential to the activities in this module — for example:

clay	habitat	soil
compost	loam	strength
decompose	moist	texture
greenhouse	sand	

Students may already be familiar with some of these terms and understand their meaning and use in scientific contexts. If so, the activities in this module will provide opportunities for them to evaluate current usage. If not, these activities will provide opportunities for students to develop their understandings.

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School authority policies

Teachers need to be aware of and observe school authority policies that may be relevant to this module, particularly the procedures involved in taking students on an excursion.

Safety policies are of particular relevance to the activities that follow. It is essential that demonstrations and student activities are conducted according to procedures developed through appropriate risk assessments at the school.

In this module, teachers need to consider safety issues relating to:

- conducting classes in the sun for example, exposing students to heat and UV rays;
- handling soil, clay and compost, which may contain microorganisms;
- handling live specimens.

Support materials and references

Fensham, P., Gunstone, R. & White, R. 1994, *The Content of Science*, Falmer Press, London, pp. 121–130.

Hepworth, L. G. H. 1986, *My Soil*, Queensland Department of Primary Industries, Brisbane.

Skamp, K. (ed.) 1998, *Teaching Primary Science Constructively*, Harcourt Brace, Marrickville, NSW, chapter 11 'The changing earth — soil', pp. 355–365.

Smythe, K. 1995, *Our World Changes: Teachers' Resource*, Science Alive series, Shortland Publications, Auckland, N.Z.



Α C T I V I T Y

How do we use the Earth and the sun?

Introductory

Focus

This activity provides opportunities for students to identify, clarify and challenge their current understandings of how humans use the Earth and sun as resources.

Materials

 print and electronic resources showing ways in which people use the Earth and sun (e.g. buildings, roads under construction, houses, factories, dams, forms of transportation, powerhouses, hydro-electric stations, wind and solar power installations, mines, trees cut down for wood, paper, parks, gardens, farms, cities, canal developments, irrigation, fishing, surfing, boating, watersports, wildlife reserves, jewellery, pottery, art, furniture, musical instruments)

Teaching considerations

Students' ideas can be presented in a variety of ways including murals, talks, posters or displays in the library.

Observe school policy requirements for excursions.



Working scientifically

Time: 45 minutes

Accessing resources Clarifying ideas and concepts Illustrating Students identify ways that people use the Earth and sun by considering a range of stimulus materials and/or undertaking a local area walk.

► Students identify the components of the Earth used by people for example, soil, water, sand, rocks, minerals, clay — and ways that people make use of the sun — for example, heat and light. They draw diagrams to illustrate the links between components of the Earth, the sun and the uses people make of them. This can be recorded in students' think books (see the initial in-service materials, p. 42).

► Students participate in a class discussion about ways in which people use the Earth and sun. Topics for discussion could include use of components of the Earth or the sun for building, making tools, mining, sunbaking, sundrying foods and clothes, growing plants at different times of the year, drying salt and seasonal activities. Students write the uses they have identified on slips of paper, categorise them and then label the categories.

- Students discuss the following questions:
- How does our use of components of the Earth change the Earth?
- In what ways are these changes beneficial or detrimental?

The discussions can be recorded in a class 'PMI' chart (students' views listed under the categories 'Plus', 'Minus' and 'Interesting').

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► Students explore ideas about changes caused by using the sun as a resource.

Students observe and discuss a classroom item such as a table. Discussion questions could include:

- What materials is it made from?
- Where do these materials come from?
- How do people get or make these materials?
- What effect might gathering these resources have had on the Earth or the environment?

Students then construct a class diagram or flow chart to illustrate their ideas.

► Students list three things they use every day and research the resources of the Earth and/or sun used to produce the items. They suggest possible effects of producing the items. Students report the results of their research and their ideas of effects to the class.

Gathering information about student learning

- students' contributions to discussions;
- students' contributions to the class diagram or flow chart;
- students' research and reports.



ΥΓΙΛΙΣ

What is soil?

Focus

This activity provides opportunities for students to explore and clarify their current ideas about soil.

Materials

For each group of students:

- Resource Sheet 1, 'What is soil?'
- materials for collecting and investigating soils, such as:
 - sheets of newspaper or trays to spread out soil samples
 - magnifying glasses
 - sieves or flywire mesh
 - straws to blow soil samples into pieces
 - hammers to crush pieces
 - glass jars of water to identify floating and sinking pieces in soil
 - safety goggles
 - trowels or spades
 - buckets or other containers

Teaching considerations

Strategies

This activity is based on a KWHL strategy.

K — What do I know?

- W What do I want to know?
- H How will I find out?
- L What have I learned?

If students have not experienced open-ended investigations before, the teacher may need to scaffold students' learning. For example, the teacher could model designing an investigation based on a student's question. The planning and reporting worksheets in the sourcebook guidelines could be used as a guide.

For information on concept mapping, refer to the initial in-service materials, pp. 38–40.



Safety

Inform students of safe practices for investigating soil — for example:

- Wash hands after handling soil or wear gloves.
- Wear safety goggles especially when pieces of soil are being crushed or when soil is being blown.
- Do not taste soil.





Working scientifically

Time: 45 minutes

Designing and performing investigations Formulating ideas Discussing thinking

Resource

Sheet I



• Students record their ideas about soil in a Think, Pair, Share activity. Discussion questions could include:

- What is soil made of?
- What is in soil?
- How do people and other living things use soil?

Ideas can be recorded using words, pictures or concept maps. Students share their ideas and create a class concept map of their current ideas about soil.

► In groups, students collect soil samples from different places in the school grounds, other accessible locations in the local area, or from home. In the classroom, they empty the soil samples onto sheets of newspaper or trays and examine the samples.

► Students construct a group concept map showing what they now know about soil. They share their group ideas with the class and make additions to the class concept map using a different colour pen.

'W' Phase — What do we want to know?

► Students reflect on the above activities and suggest researchable questions about soil (see the sourcebook guidelines, p. 35). Some possible questions are listed on Resource Sheet 1.

'H' Phase — How will we find out?

Students brainstorm ways of finding answers to their questions. They work in groups to investigate their questions.

'L' Phase — What have we learned?

► Students discuss ways of reporting the results of their investigation to the class and then prepare and present their reports. In groups, students discuss what they have learnt and record their ideas in their think books. They use these ideas to modify their group concept maps and then the class concept map.

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Gathering information about student learning

- students' researchable questions;
- students' plans for investigations of their questions;
- group/class concept maps.



Α C T I V I T Y	
The uses of soil	Developmental

Focus

This activity provides opportunities for students to explore the properties of soil and from this extrapolate to suggest possible ways soil may be used by people and other living things.

Materials

For each student:

- one teaspoon of each of the following soil types:
 - sample A: sandy soil
 - sample B: loamy soil
 - sample C: clayey soil

Teaching considerations

Activities could be developed for other resources used by living things such as water, minerals, rocks or clay.



Safety

Inform students of safe practices when investigating soil — for example:

• Wash hands after handling soil.



Working scientifically

Time: 30 minutes

Handling materials Inferring from data Creating tables ► Students work in pairs, taking turns to investigate each of the three soil types. Each student places a teaspoon of soil into the palm of their hand and their partner then adds water drop by drop until it is wet but with no excess water. They manipulate the mixture — for example, making it into a long roll, flattening it out like a pancake, or creating a brick shape. The way soil behaves in such a test is described by soil scientists as 'soil texture'. Students record their observations in the first two columns of a chart like the one below.

Soil	texture
301	lexture

	No excess water		Excess water	
Soil sample	How it behaves	How it feels	How it behaves	How it feels
А				
В				
С				
$\Box \sim \sim$	<u> </u>			\square



Students add two or three more drops of water to their sample, repeat their exploratory activities and again record their findings in the chart.

► Students reflect on these activities, and discuss how different properties of soil may lead to different uses by people or other living things. They record their ideas in their think books.

► As a class or in groups, students discuss their ideas and create a concept map of possible uses of soil by animals, plants or people.

Gathering information about student learning

- students' completed tables;
- students' contributions to discussions about uses of soil.

ΑСΤΙΥΙΤΥ

Resource

Sheet 2

The effect of the sun on plant growth

Developmental

Focus

This activity provides opportunities for students to investigate the effect of the sun on the growth of plants.

Materials

Resource Sheet 2, 'Sun and the growth of plants'

Materials required for this activity will depend on the investigations devised by students.

Teaching considerations

Resource Sheet 2 suggests an approach for investigating the effect of the sun on the growth of plants.

A scaffold such as 'Cows Moo Softly' (see the sourcebook guidelines, p. 35) can be used to help students identify:

- What to change (C);
- What to measure (M);
- What to keep the same (S).

This activity will prepare students for the demonstration of Science and Society core learning outcome 4.2, 'Students use the elements of a fair test when considering the design of their investigations'. Refer to the initial in-service materials (pp. 52–53) and the sourcebook guidelines (pp. 34–36 and appendix 3) for ways to help students plan and conduct their investigations.

This activity could be repeated using seeds to examine the effect of light on germination and growth — always plant two or three seeds in each sample to allow for the possibility of not all seeds germinating.



Working scientifically

Time: 30 minutes initially, then daily observations and recordings over 6 or 7 days (a further 60 minutes)

Designing and performing investigations Formulating and elaborating ideas Creating tables ▶ Students discuss their ideas about plants, their need for sunlight and what would happen to plants that received little sunlight.

► Students brainstorm ideas about ways to investigate the question 'What effect does the sun have on the growth of plants?' In groups, they discuss the design of their investigation considering the following:

- the materials they will require;
- what they will change;
- what they will keep the same;
- the observations they will make and how to record them;
- how often observations will be made and for how long.



• Students perform the investigation and interpret the results in relation to the original question. They report their results to the class.

• Students write a sentence in response to the statement 'What I think about plants and sunlight'.

► Students reflect on the results of their investigations — considering the implications for people, other animals and plants of living in places that have few hours of sunlight each day. They record their ideas in their think books.

Additional learning

► Students explore the effects of different soil types on plant growth. Possible soil types could include sandy soil, potting mix, clay soil, and red soil.

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Gathering information about student learning

- students' observational notes and records;
- students' contributions to discussions;
- students' investigations and presentations of reports.

Α C T I V I T Y

Why do gardeners grow plants in greenhouses?

Developmental

Focus

This activity provides opportunities for students to investigate ways in which the use by plants of resources from the Earth (water) and sun (light) can be modified.

Materials

For the demonstration:

- small plant pot (or yoghurt container) with 2–3 seedlings planted in potting mix
- large, clear plastic bag
- 3 thin stakes
- string

For the class:

- research resources on greenhouses
- other materials required for this activity will depend on the model greenhouses students construct. Examples of things they might use are:
 - 2 L clear, plastic soft drink bottle or sheets of clear plastic or plastic bags
 - small plant pots (or yoghurt containers or cut-down milk cartons with holes pierced in them for drainage)
 - flower or vegetable seeds
 - potting mix

For the teacher:

• Resource Sheet 3, 'Investigating the use of greenhouses'

Teaching considerations

Set up a mini-greenhouse as a demonstration for students. Three possible models are shown in the diagrams below.





Suggestions for an investigation are provided on Resource Sheet 3, 'Investigating the use of greenhouses'.

This activity will prepare students for the demonstration of Science and Society core learning outcome 4.2, 'Students use the elements of a fair test when considering the design of their investigations'. Refer to the initial in-service materials (pp. 52–53) and the sourcebook guidelines (pp. 34–36 and appendix 3) for ways to help students plan and conduct their investigations.

Safety

Inform students about safe practices for handling commercial potting mix — for example:

- · Check warnings on the packaging.
- · Avoid breathing in dust and spores.
- Wash hands after using the mix.



Working scientifically

Time: 30 minutes initially; various times to monitor and record observations over at least 6 to 7 days

Making and judging observations Predicting Making comparisons ► Students observe the mini-greenhouse. They predict the effect of a greenhouse on the conditions (microclimate) surrounding plants and the subsequent growth of plants.

Students research the construction and use of greenhouses.

▶ In groups, students discuss ways they could create a greenhouse and investigate its use. They decide:

- the materials required;
- which observations they will make and how to record them;
- when to make the observations and for how long.
- Students perform the investigation. They compare their observations of:
- conditions (microclimate) in the greenhouse and in the open;
- plants grown in different microclimates.
- Students reflect on their results and consider:
- how using a greenhouse has changed the microclimate in which the plants are growing;
- the effects on plant growth of these changes.

► Students suggest changes that could have improved their investigations or other research questions around which investigations could be designed. They discuss ways of reporting their findings to the class, then prepare and present their reports.

► As a class, students list the advantages and disadvantages they found of growing plants in a greenhouse. They consider where in Australia or the rest of the world greenhouses are commonly used. They discuss any differences in climate between those areas and the local area and record their ideas on whether the advantages and disadvantages of using greenhouses would be the same.





Gathering information about student learning

Sources of information could include:

- students' contributions to discussions;
- students' predictions;
- students' design of the investigation, observations and recording of results;
- students' report to the class;
- students' list of advantages and disadvantages of growing plants in greenhouses.



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Developmental

Α C T I V I T Y

The use of soil in mud bricks

Focus

This activity provides opportunities for students to investigate the use of soil and other materials from the Earth. They design and make mud bricks and test them in relation to criteria they have devised.

Materials

For each group:

- jar/can for mixing
- spoon/stick for stirring
- 4 or 5 brick moulds per group (e.g. matchboxes, cut-off yoghurt containers, or specially constructed frames)
- materials for making bricks (e.g. soil, water, clay, sand, straw or dead grass, gravel)

Teaching considerations

The tests for strength, water resistance and mass can be designed by students, negotiated with students or nominated by the teacher.

Discuss conditions for testing with students. Similar conditions should be used for all bricks to make the testing fair. Discuss with students ideas about fairness of tests as a preliminary to preparing students for the demonstration of Science and Society core learning outcome 4.2, 'Students use the elements of a fair test when considering the design of their investigations'.

Some local authorities use a strength test in which the brick is hit with a jet of water from a hose. You could arrange for the local council to visit and demonstrate tests for students.



Working scientifically

Time: 60 minutes, plus time as required to make and dry bricks

Designing and performing investigations Formulating questions Identifying and controlling variables Making and judging observations Examining and evaluating Interpreting data Making comparisons Discussing thinking ► Students discuss the criteria by which bricks could be judged as suitable for building. They could consider aspects such as strength, mass, water resistance, availability of materials, cost and maintenance. They discuss ways in which these aspects could be investigated.

Students discuss ways of making bricks. Points for discussion could include:

- materials that could be added to the mud to increase the strength of the brick — for example, straw, wire, sand;
- size of brick and moulds to be used;
- the method and duration of drying the bricks for example, they could be left in the sun or baked in an oven.

▶ In groups, students make bricks according to their recipes. They design and perform investigations of their bricks and record the information they have collected. They compare their results with those from other groups.



► As a class, students formulate questions arising from their activities and propose further investigations that could be undertaken to answer their questions. They relate the results of their investigations to ways that bricks and buildings are constructed.

Additional learning

Students research other ways of making bricks (such as clay bricks or cement blocks) and compare these other bricks with the mud bricks they have made.



Gathering information about student learning

- students' contributions to discussions;
- students' investigations;
- students' questions.



Developmental

A C T I V I T Y How do earthworms use soil?

Focus

This activity provides opportunities for students to understand that various living things such as earthworms use soil as a habitat and food source.

Materials

For the teacher:

• Resource Sheet 4, 'Making a wormery'

For the class:

materials on Resource Sheet 4

Teaching considerations

This activity is based on setting up and observing a wormery. Encourage students to devise their own way of making the wormery. One method is suggested on Resource Sheet 4 but use this only if necessary.

Activities could be developed using the wormery to prepare students for demonstrating Life and Living core learning outcomes 3.1, 'Students draw conclusions about the relationship between features of living things and the environments in which they live' and 3.3, 'Students describe some interactions (including feeding relationships) between living things and between living and non-living parts of the environment'.

Assist students to develop understandings of the elements of a fair test in preparation for demonstrating Science and Society core learning outcome 4.2, 'Students use the elements of a fair test when considering the design of their investigations'.

Refer to the initial in-service materials (pp. 52–53) and the sourcebook guidelines (pp. 34–36 and appendix 3) for ways to help students plan and conduct their investigations.



Resource

Sheet 4

Working scientifically

Time: 45 minutes initially; various times to monitor and record observations over at least two weeks; time to research and do a presentation

Collecting information Formulating questions Examining and evaluating Students discuss what they know about earthworms and brainstorm ideas for creating a wormery.

► Students set up a wormery with teacher assistance. They record their observations of the wormery after it has been established but before the earthworms have been added. After seven days and then fourteen days, students record observations. Questions to guide observations could include:

- What do the layers look like now?
- What has happened to the soil? How did this happen?
- What has happened to the food placed on the surface?
- What do the earthworms do to leaves placed on the surface?

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► Students discuss their observations and develop a list of researchable questions. These questions might include:

- How deep do earthworms burrow?
- What would happen if you left an earthworm in the sun?
- Where are most of the earthworms to be found?
- Which food do the earthworms appear to eat first?
- How would you discover the best composition of soil for breeding earthworms?

▶ In groups, students discuss ways of collecting information to answer their questions. They carry out the investigations and record their findings and reflections in their think books.

► Students prepare a presentation for other classes to explain how they carried out their investigations, what they now know about earthworms and how earthworms use materials from the Earth.



Gathering information about student learning

- students' contributions to discussions;
- students' records of questions, observations and investigations;
- students' presentations.



ΙΥΙΤ What have we learned?

Focus

This activity provides opportunities for students to reflect on their understanding of how living things use the Earth and sun as resources.

Materials

records of findings and ideas from previous lessons



Working scientifically

Time: 60 minutes

- In groups, students brainstorm four different ideas: ►
- What do I know about the ways plants use the Earth as a resource?
- What do I know about the ways animals use the Earth as a resource?
- What do I know about the ways plants use the sun as a resource?
- What do I know about the ways animals use the sun as a resource?

Students share their ideas with the class. They identify ideas requiring clarification and formulate questions to guide investigations then find answers to their questions.

Students create a class presentation or display that shows their understanding of the ways in which plants and animals use the Earth and sun as a resource. The presentations could be in a variety of formats, including a concept map, annotated collage or painting, a story, letter or newspaper article, or a PowerPoint presentation.

Gathering information about student learning

Sources of information could include:

- students' records of new understandings;
- students' contributions to discussions;
- students' presentations.

Generalising Making comparisons **Reflecting and** considering Summarising and reporting





Resource Sheet

What is soil?

Some questions raised by students investigating soil have included:

- Why is soil different colours?
- Where does soil come from?
- What is soil?
- Will plants grow in any type of soil?
- Will plants grow best in black soil?
- What is the best type of soil to grow wheat/beans/other seeds?
- What is 'compost' and where does it come from?
- What animals live in soil?
- Why do animals live in soil?
- What do earthworms do to soil?
- Is there air in soil for animals to breathe?
- Is there water in dry soil or air in wet soil?
- How much water can different soils hold?
- What is in the spaces in soil before the water runs into the space?



Sun and the growth of plants

Each group will need:

- 3 small plants of the same type and approximately the same size for example, alyssum, marigold, petunia
- 2 large boxes
- water
- 1. Students label the three plants of the same type and approximate size 'sunlight', 'some sunlight', 'no sunlight'.
- 2. The plants are placed in a sunny position and given equal amounts of water for three to four days.

Observing the plants

- Each day students make observations and record their findings in their think books. Questions to guide observations could include:
 - What colour are the leaves of each plant?
 - How high is each plant? How much change has there been?
 - What are the differences between the plants?
 - How are they the same?
- For the next three to four days students treat the plants to different amounts of sunlight:
 - they cover the 'no sunlight' plant with a box, removing the box only to water the plant;
 - they cover the 'some sunlight' plant with a similar box. This box is removed for one hour at the same time each day;
 - they leave the 'sunlight' plant uncovered.

A similar amount of water is provided for all three plants. This is a good opportunity for students to discuss the control of variables.

Students observe the plants each day to identify any changes occurring and record their findings in their think books. Questions like those above could continue to be used to guide their observations. This can be recorded as diary style entries or as a retrieval chart like the one on the next page.

(continued)



Resource Sheet 2

Sun and the growth of plants (continued)

Effect of sunlight on plants

Sun and the growth of plants (continued)				Resourc	
				Characteristic	Date
Colour of leaves					
Height of plant (cm)					
Change in height (cm)					
Differences between the plants					
Similarities between the plants					

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Investigating the use of greenhouses

One possible way to investigate greenhouses

- Plant 2 or 3 seeds (in case some seeds do not germinate) in each of two pots filled with potting mix;
- make a greenhouse one of the models shown on p. 14 could be used;
- place one pot with the seeds in the greenhouse then place both pots in the sunlight;
- remove the covering for a few minutes each day to let in fresh air;
- water both pots following a plan decided by the group;
- observe and record differences in the conditions in which the plants are growing and the effect on plant growth.

Possible comparisons inside and outside the greenhouse

- range of air temperatures throughout the day
- relative humidity
- rate at which the soil surface dries out
- the amount of water required to prevent wilting of plants
- time taken for the seeds to sprout
- number of seeds that sprout
- colour of the leaves
- number of leaves per plant
- height of plant
- thickness of plant stem

Graphs would be a useful way of comparing the data collected on air temperature, relative humidity and amount of water required.

Issues to consider

In Queensland, plants in greenhouses exposed to the full sun are likely to burn, especially in summer.

Inside a greenhouse the relative humidity will be higher than outside and greenhouse plants will use less water. Providing all the plants with the same amount of water may result in the plants inside the greenhouse being over-watered. This may cause them to rot and/or be susceptible to fungal infection.



Making a wormery

You will need:

- **Resource Sheet** 4 · large, wide-mouthed, clear plastic jar, storage container or small aquarium, preferably with considerable depth
- black paper or cloth to cover the outside of the storage container
- soil .
- sand .
- sheets of newspaper
- bottle to spray or sprinkle water
- piece of hessian to cover the top of the soil
- fine mesh (e.g. nylon stocking, netting or cheesecloth)
- elastic band
- earthworms

Setting up the wormery

Layer soil and sand into a clear container until it is three-quarters full. The soil layers should be about 5 cm thick, and the sand layers about 2.5 cm thick. Finish with a soil layer.

If you have access to a variety of soils (black soil, red soil, different coloured sands), these can be included as layers.



Suggested organisation of a wormery

(continued)



Making a wormery (continued)

- Use a spray bottle to moisten each layer as you go, including the top layer, so that everything is moist but not wet. If the soil is too wet, water will fill all spaces in the soil and the earthworms will drown.
- Mark the position of the layers on the outside of the container with a pen or masking tape.

Adding the earthworms

Earthworms can often be found on the ground in the evening after rain. A wet hessian bag placed on the ground can also cause them to come to the surface. Walk lightly and use a torch covered with red cellophane (earthworms are not sensitive to red light). Into a storage container collect earthworms and soil from the area in which they were found. Alternatively, large quantities of earthworms can be purchased at very reasonable prices from 'worm farmers' (check the Yellow Pages telephone directory or local newspapers). After the student activities, the earthworms can be placed in the school gardens.

- Remove the earthworms from the soil in which they are found and keep them in a moist, dark place such as on a moistened paper towel in a shoe-box. If the skin of earthworms becomes dry, they will die.
- Place the earthworms on the top of the soil and cover with a piece of damp, thick hessian. Cover the top of the container with mesh and secure with a rubber band. Cover the outside of the wormery with black paper or cloth and place in a dim, cool place.

Making observations

Earthworms use soil as their habitat and food source. They are decomposers and recyclers, helping to keep soil fertile.

Earthworms will multiply rapidly if kept fed, watered and in a dark place.

- Each day, lift the hessian and spray the top soil layer with a little water and add some food (small kitchen scraps, tea leaves, coffee grounds, vegetable peels, corn meal, oatmeal, chicken feed, damp decaying leaves, dampened paper, cardboard anything that was once living).
- For the first week, disturb the wormery only to water and feed the earthworms. Then the black paper can be removed for short periods for observations.

ESOURCES FOR LIVING THINGS • MIDDLE PRIMAR



This sourcebook module should be read in conjunction with the following Queensland School Curriculum Council materials:

Years 1 to 10 Science Syllabus Years 1 to 10 Science Sourcebook: Guidelines Science Initial In-service Materials

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